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## Policy Brief

# Pathways to Agroecology in India: Economic benefits of sustainable land management

*This policy brief uses two case studies from India conducted by Development Alternatives (DA) and Watershed Organisation Trust (WOTR) to demonstrate how sustainable land management practices are linked to the holistic approach of agroecology and how economic arguments can support decision making. The results of the two studies provide evidence for the economic benefits of sustainable land management practices, show the interconnectedness of healthy land and*

*other ecosystem services as well as income, livelihoods, and the well-being of human populations. This clearly shows the need to adopt a holistic approach to manage our land, which goes well in line with the principles of agroecology (AE). Furthermore, it enables the drawing of recommendations for stakeholders at the following interaction levels of agroecology: (1) Farm / Household, (2) Agro-ecosystem / Rural Community, (3) Food System / Consumer and (4) Society and Politics.*

### Key Messages

- 1. Transitioning to agroecology in India** can build on the existing experience of Land Remediation and Watershed Development by planning and implementing at entire ecosystem levels, and integrating agro-ecological principles.
- 2. Investments in Sustainable Land Management (SLM) Programmes** increase income of farmers and rural households, reduce land degradation, enhanced climate adaptation and mitigation co-benefits, and contribute to the conservation of biodiversity and environment. SLM leads to soil fertility with an increase of soil organic matter and thus contributes to CO<sub>2</sub> sequestration.
- 3. To unleash its full potential**
  - **Policies and instruments are needed to**
    - o Align existing watershed and other soil and water conservation efforts towards more **integrated planning and implementation focusing on the entire ecosystem**, the services it provides and related impacts.
    - o Provide **incentives for farmers** to shift to agroecological practices, both through reduced costs of cultivation and better market linkages.
    - o Allocate **sufficient resources** through leveraging and convergence for supporting agroecological based planning and implementation on local and regional level.
  - **The adoption of agroecological practices** needs to be based on a holistic approach at farm/ household and landscape level.
  - **Co-creation of knowledge** through participation of the local community and the cooperation between science, extension services and farmers during practical application is key.
  - **Monitoring and (economic) evaluation** provide evidence for the impact of the approaches and practices.

## Introduction

During the last years, with the support of the High Level Panel of Experts (HLPE), the Food and Agriculture Organization (FAO) developed the concept of agroecology (AE) with principles for the transformation of the agriculture and food system. This concept is about to be adopted in the national policies of many countries all over the world. Based on the work of Stephan R. Gliessman and the HLPE, the concept describes 13 principles (see **GIZ Agroecology Fact Sheet**). The principles of AE target the most urgent challenges faced by the whole agro-food-system with a holistic approach but not necessarily with rigid application of farming practices. The principles should be considered as guiding pathways rather than pre-defined rules to comply with. Through the concept of AE, the international community addresses the most relevant challenges of the agri-food system, including:

**1. Land degradation**, which is one of the most severe threats to sustainable land use in many areas of India. As per various estimates about 130 million hectares (ha) are degraded and wastelands. The national Land Degradation Neutrality target aims at restoring 26 million ha of degraded land by 2030. This would contribute to India's commitment to achieve an additional carbon sink of 2.5 to 3 billion tonnes of CO<sub>2</sub> equivalent (PM Shri Modi 2021).

**2. Food security** for a growing population, maintaining healthy ecosystems to support livelihoods and the economy and well-being of people. The National Mission for Sustainable Agriculture (NMSA) in India outlines the strategy and targets in detail.

**3. Adaptation to climate change**, climate resilient agriculture ensures future-proof agricultural and food (agri-food) systems. The National Innovation in Climate Resilient Agriculture (NICRA) demonstrates many success stories of climate smart villages (Murai et al. 2020). The programme is part of Indian dedicated contribution to the United Nation Framework Convention for Climate Change (UNFCCC).

**4. Biodiversity loss** is another important challenge our world is facing. India implements the National Biodiversity Action Plan (NBAP) as its contribution to the United Nation Convention on Biological Diversity (CBD). The NBAP indicates the many links between sustainable agriculture and the conservation of biodiversity.

## Four levels of integration of agroecology

Although the holistic approach of AE is the basis of the concept, the principles can be clustered and related to four levels of integration. These four levels of integration are also understood as levels of “intervention” and “decision-making” and thus used synonymously<sup>1</sup>.

Still, all attempts to cluster the 13 principles should not lead to simplification or reduction of the complexity of the concept of AE and thus neglect the holistic approach.

T A B L E 1

4 levels of integration	13 principles of AE
1. Farm / household	1. Recycling 2. Input reduction 3. Soil health 4. Animal health
2. Agro-ecosystem / rural community	5. Biodiversity 6. Synergy - among the elements of agroecosystems (animals, crops, trees, soil and water) 7. Economic diversification of on-farm incomes 8. Co-creation of knowledge 9. Social values and diets
3. Food system / consumer	10. Fairness 11. Connectivity
4. Society and politics	12. Land and natural resource governance 13. Participation - in decision-making by producers and consumers

*AE is widely considered a science, a set of practice and a social movement and therefore concurs with a transdisciplinary, participatory and action-oriented approach across ecological, agricultural, food, nutritional and social sciences. Wezel et al., 2020, p. 39*

<sup>1</sup> **Integration:** since principles are strongly interrelated - especially on level 1 and 2; **Intervention:** since projects and programmes usually address a set of principles but not all of the principles; **Decision-making:** since decision makers on different levels need specific information and support.

## Agroecology in the Indian policy for agriculture and rural development

AE is considered a sustainable approach to agriculture development in India. During the National Dialog “Indian Agriculture towards 2030” in January 2021, organised by the National Institution for Transforming India (Niti Aayog), the Ministry of Agriculture and Farmers’ Welfare (MoA&FW), and the FAO, the concept of AE (Prabhu, 2021) and its practical implementation in Andhra Pradesh: Climate resilient, community managed Natural Farming (APCNF) (Kumar, 2021) was presented. This forum also discussed the challenges of the next decades for the agriculture and food system in India.

The National Bank for Agriculture and Rural Development (NABARD) has been implementing watershed management programmes. To further this and adopt an integrated resource management approach, NABARD is working on strategies towards AE.

The transformation of the agri-food system in India towards AE is not just a discussion but an ongoing practice and, to a great extent already included in the existing policies. The NMSA highlights the need for integrated farming, water use efficiency, soil fertility, and conservation of natural resources.

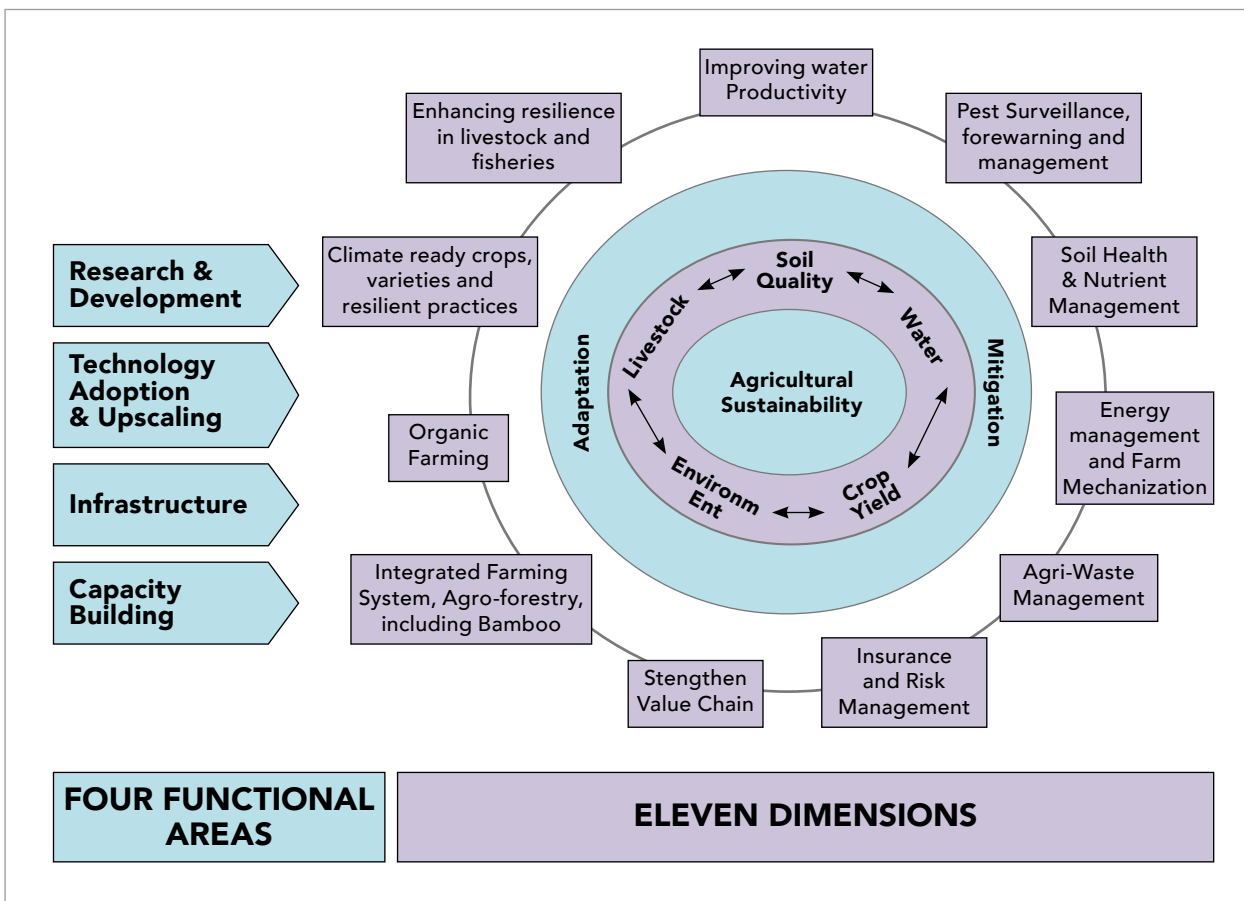
The support for the development of organic farming as one way to implement the concept of AE, is promoted in many states. Madhya Pradesh, Rajasthan and Maharashtra accounting for half of the area under organic cultivation of a total of ~2.8 million ha in India.

Natural Farming (NF) approaches implemented and scaled by APCNF in Andhra Pradesh comply with most of the principles of AE. Programmes such as the Paramparagat Krishi Vikas Yojna (PKVY) foster organic farming, and thus environment friendly farming practices.

Agro-environmental measures, sustainable agriculture, climate-smart agriculture and many other

FIGURE 1

### Areas and dimensions of the Indian National Mission for Sustainable Agriculture (NMSA)



terms are used to describe similar approaches which consider the principles of AE. Furthermore, India has a long history of participatory research and co-creation of knowledge, based on community led development approaches and farmer to farmer extension.

Comparing the design of the NMSA with its four functional areas and 11 dimensions (see figure 1) with the 13 principles of AE (see figure 2) reveals the compliance and correspondence of the two concepts. Only the terminology and the structure of the elements of the two concepts differ such as:

- Soil quality (NMSA) and soil health (AE)
- Environment (NMSA) and biodiversity (AE)
- Capacity building (NMSA) and co-creation of knowledge (AE)
- Agri-waste management (NMSA) and recycling (AE)

**FIGURE 2**

**Levels and principles of Agroecology (AE)**



The results of the two studies outlined on the next two pages, prove the benefits of land remediation and watershed management programmes with regards to the principles of AE and similarly to the dimensions of the NMSA.



## Economics of Land Remediation

Development Alternatives started in 1985 with the support of local governments, national and international sources. The interventions ranged from establishing water harvesting and erosion control structures as well as promoting SLM, including soil and water conservation structures, check-dams, tanks, ponds, field bunding, gabions and gully plugs as well as off-farm and non-farm income generation activities, adopting climate adaptation methods and improving agricultural production. The key findings of the study in 18 intervention villages and 12 control villages in 3 districts in the Bundelkhand region in Madhya Pradesh are summarized in table 2.

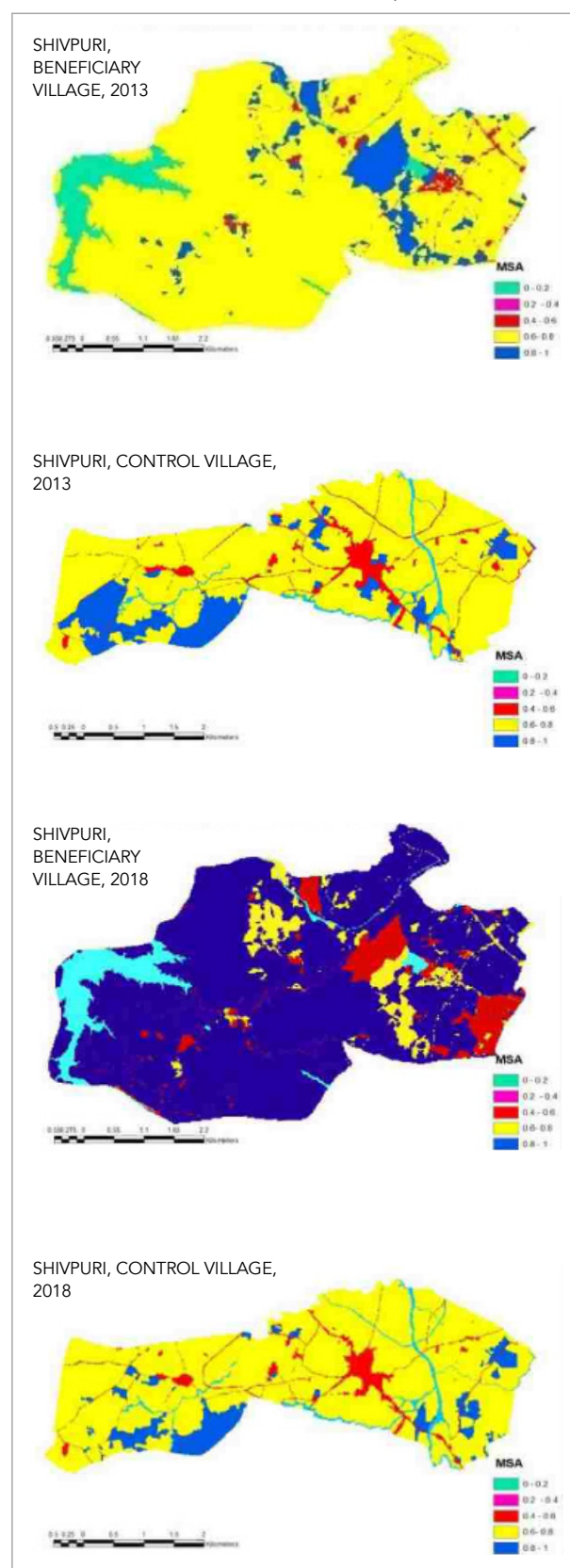
T A B L E 2

Indicators (selection)	Intervention (control) villages
Change in double cropping area in ha	<b>+21%</b> (+14%)
Agriculture productivity of wheat and rice (Q/ha)	<b>15 &amp; 18</b> (0 to 27)
Lesser decline in area of waterbodies*	<b>-10%</b> (-23%)
Decrease of wasteland in % of ha, based on 138 ha in the intervention villages and 260 ha in control villages	<b>-25%</b> (-9%)
Higher increase in biodiversity benefits (Mean Species Abundance) in intervention villages*	<b>+0.08</b> (+0.01)
Higher increase in carbon sequestered benefits (in thousand INR) per unit of land (in hectares) as a result of the intervention*	<b>+15</b> (-8)
Higher increase in income (in thousand INR) per unit of land (hectare) from cropping in intervention villages*	<b>+23</b> (- 26)
Higher increase in income (in thousand INR) per household from livestock rearing in intervention villages*	<b>+97</b> (+0.01)
Higher decline in rate (%) of adult migration in intervention villages*	2013 <b>57</b> (75) 2018 <b>15</b> (39)
No. of social institutions (e.g. self-help groups) formed in 2 districts by 2018	<b>72</b> (52)

\*Value of one district, which had the best-observed value among the three districts. All figures refer to the period of 2013 to 2018.

FIGURE 3

**Mean Species Abundance (MSA) and Land use (LU)** in the intervention cluster compared to control cluster (2013-2018) in the Shivpuri District



## Economics of Watershed Development

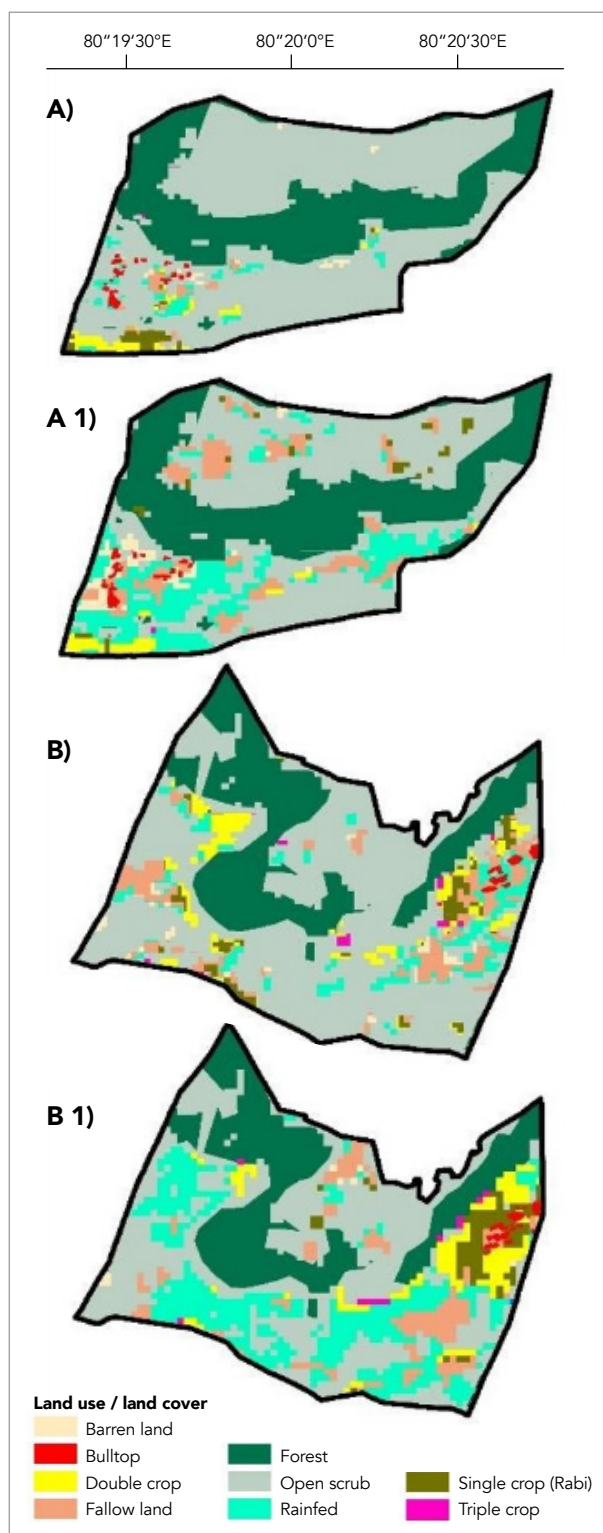
WOTR implemented Watershed Development projects in Dungariya, Partala, Katangi in Mandla district, and Kareli in Jabalpur district in the state of Madhya Pradesh from 2008/09 to 2010/11 and in Kareli up to 2011/12. In Dungariya and Partala additionally, the Integrated Watershed Management Programme (IWMP) was implemented by WOTR and PRADAN respectively. The SLM interventions included area treatment and afforestation on private lands, drainage line treatment, capacity enhancement, institution building, and promotion of agriculture and livelihoods. Selected results of the interventions are outlined in table 3.

TABLE 3

Indicators (selection)	Intervention (control) villages
<b>Detachment/accumulation of Soil Organic Carbon</b> (- sign is for detachment)	
- SOC upper villages SOC detachment reduced by	<b>33% to 65%</b> (24% to -567%)
- In lower catchment villages SOC accumulation reduced by	<b>51% to 54%</b> (51% to -82%)
<b>Land Use, Land Cover and Cropping Intensity</b>	
- Increase of Gross Cropped Area	<b>33%</b> (20%)
- Reduction of fallow land	<b>15%</b> (8%)
- Reduction of uncultivable land	<b>49%</b> (31%)
<b>Change in Distress migration</b>	<b>-67%</b> (-43%)
<b>Increase in crop productivity (for main crops)</b>	
- Kharif crop productivity	<b>+60% to 170%</b> (-3% to +160%)
- Rabi crop productivity	<b>+70% to +260%</b> (-10% to +170%)
<b>Cost benefit analysis</b>	
Net Present Value (in INR)/ hh	<b>100,275</b> (85,449)

FIGURE 4

**Land Use and Land Cover** map of the project village Dungariya in the year 2008 (A) and 2018 (A1) and control village Kui.Ryt, in 2008 (B) and 2018 (B1)



Please note: The results of the two studies had different approaches and questions they were answering. In this section it is not intended to compare results, but rather to show how both studies with their different design bring results that help to identify the economic benefits of agroecological approaches.

## Discussion of the study results linked to the integration levels of agroecology

Using economic metrics to value and account for ecosystem goods and services has the potential to show the true value of SLM to stakeholders from different levels and sectors. It provides the economic rationale for investing in more sustainable practices and applying an agroecological approach. Besides the ecosystems benefits from SLM, there are also significant losses if the land is and continues to be degraded. Economic valuation reveals the costs of unsustainable practices and benefits from sustainable management. In this way it supports decision-making at policy and implementation levels.

The aforementioned studies provide evidence for the benefits of SLM practices. This section summarizes the main result of the studies and links them to the four integration levels of AE:

### 1. Farm / household

The respective SLM practices implemented in the two study sites show a difference between the benefits gained in intervention villages as compared to the control villages. The treated villages have better soil and water conservation and reduced losses. This led to introduction and increase in double cropping, and a reduction in fallow land. There was also reduction in chemical inputs and an improvement in soil health. This benefited households by an increase in income from the sale of farm produce, and provided them with work within the village for longer periods as well as water for domestic needs.

### 2. Agro-ecosystem / rural community

The most apparent changes occurred with respect to overall land utilisation in the intervention areas. The reduction of fallow and waste land provides evidence of a positive impact of the SLM interventions (see figures 3 and 4).

The diversification of crops and the development of other economic activities, showed positive effects on income and income stability.

As overall result at the agro-ecosystem level, we observe a lower level of erosion with the associated benefits on water retention and water availability for the entire rural community.

The establishment of social institutions and civil society organisations, provided constant support to the progress of the interventions during the project implemen-

tation, and is expected to do so beyond the project's duration. Such institutional capacities of community-based institutions and supporting civil society need to be further strengthened to ensure sustainability.

### 3. Food system / consumer

Although the producer-consumer relations were not a focus of the interventions, increased yields and the diversification of income contributes both to food security and 'dignified and robust livelihoods' as part of the principle of 'Fairness' at the level of food system.

### 4. Society and politics

The interventions show a positive cost-benefit ratio and thus contribute to sustainable development, and related to social and political objectives.

By applying a capital approach, the case study of Bundelkhand shows the benefits of SLM interventions across social, human, natural, and cultural capital using a diverse range of indicators such as: rate of migration, number of social institutions, carbon sequestration, income, and health.

The economic valuation of Watershed Development in Eastern Madhya Pradesh proves that the investment in land restoration of degraded landscapes, following a ridge-to-valley watershed approach with active community engagement, enhances the provisioning, regulating and supportive ecosystem services and thus directly and indirectly resulting in increased income of inhabitants. There is an urgent need to steer public investment such as the Mahatma Ghandi National Rural Guarantee Act (MGNREGS), PMKSY, IWMP, the World Development Federation (WDF) of NABARD, and similar land related projects and schemes, to include a comprehensive land, forest protection, and drainage line treatments with the active involvement of the local community.

The observations derived from these two case studies are also supported by other recently published reports:

- The report 'Sustainable Agriculture in India 2021 – What we know and how to scale up' of The Council on Energy, Environment and Water (Gupta et al. 2021) documents the relevance of similar type of interventions referring to the principles of AE. The study assessed sustainable agriculture practices and systems in India to map their adoption on the ground. The study reveals a significant positive impact on the economy, society, and the environment by adopting farming practices such as NF and Conservation Agriculture.

- The report “Economics of desertification, land degradation and drought in India” of The Energy and Resources Institute (TERI), 2018 shows the urgent need for action and investment in land restoration.
- The preliminary findings of the case study ‘Ecosystem Based Adaptation: The case of Purushwadi district in Maharashtra’ elaborated by the WOTR Centre for Resilience Studies (W-CReS) in cooperation with TMG Think Tank for Sustainability (Joshi et al. 2021) also confirm similar results.

### Policy Recommendations on Pathways to Agroecology – benefits of sustainable land and ecosystem management

Building on the study results that demonstrate the economic benefits of introducing SLM along the levels and principles of AE, recommendations for the design of future programmes and policies can be drawn.

An agri-food system that builds on healthy land and ecosystems will cope better with climate and disaster risk, supports livelihoods, and ensures food security. AE needs a shift in the mindsets of all stakeholders involved, at all levels of interventions. Although focusing on district or village level, the results of the two studies demonstrate the interconnectedness across different types of capitals. This clear relation between healthy land and ecosystem, livelihoods, and well-being emphasize the need for a holistic multi-level approach.

#### Co-creation of knowledge and participation

The principles ‘Co-creation of knowledge’ and ‘Participation’ are most relevant at all levels of integration. Ensuring participation in economic assessments and evaluation studies is key to understand and cater to the needs of stakeholders, to gather information and to validate results. The active involvement of the local community and the participation in decision making of various stakeholders, is essential for success of programmes and policies.

#### AE principles on the farm level

Increasing soil organic matter and the soil organic carbon by sustainable practices, creates a huge adaptation benefit and sequestering carbon in soils. These soil indicators are directly linked and influenced by all principles of AE on the farm level. Recycling of organic matter from rural as well as urban areas to soils, the reduction of inputs and use of NF approaches, including the integration of animal husbandry, are the key to unlock the complexity of agriculture cropping systems. The cosmos of micro-organisms below the ground, provides the starting point of the long food chain for all species above ground (insects/pollinators, birds, etc.). It is most important to support research on alternatives to conventional inputs by providing incentives for the farmers to adopt AE-based farming practices. Economic scenarios that model costs and benefits of different practices in the future are an important source to identify suitable practices, and to set the right incentives. Relevant decisions at the farm and household level are largely determined by economic advantage and benefits generated by the agriculture practices, and additional incentives.

- Farmers need farm-based, locally contextual models and practices to adopt nature-based approaches, optimizing on locally available resources (e.g. indigenous seeds and crop varieties).
- Specific regional strategies for AE are needed.
- The integration of traditional knowledge into latest research-based knowledge should be compulsory.
- Communication with farmers is needed instead of extension only.
- Not only increased yield but other incentives, such as subsidies for alternative inputs should be provided to supplement farmers’ incomes by AE services.
- AE transformation is knowledge intensive. Hence the extension services need to provide knowledge around AE to the farmers. Peer-to-peer learning and exchange should be supported through innovative processes and digital tools. For example more than 6,000 champion farmers are under APCNF.



## AE principles on the landscape level

Many of the targets for sustainable land management depend on the agro-ecosystem and need to be contextualized to local needs and values. The participation of the stakeholder needs facilitation and capacity building in the sense of social capital. Biodiversity, and thus the synergies within the elements of the agro-ecosystems, can only be valorised by the diversification of the farm incomes. Politics and public institutions need to create an enabling environment to fully make use of the benefits of the natural resources and biodiversity. Financial resources and capacities need to be provided to ensure continuous support and involvement through consulting, facilitation, and extension within the land remediation and watershed development programmes. These are necessary and will pay off in the long run.

- Existing efforts around soil and water conservation and agricultural development measures should be comprehensively planned at ecosystems levels and hence integration of AE principles is recommended.
- AE helps remaining and restoring natural capital by reducing the loss of biodiversity.
- The role of community institutions and their capacities to build sustainable land ecosystem management plans at village levels needs to be further supported and strengthened.
- Social capital created by self-help groups (SHGs) and federations is key (in India around 70 million women are organized as SHGs and federations).
- Participants of the consultation estimate that implementation of AE needs 5 to 8 years of support at village level through community-based organizations.
- Leveraging resources of MGNREGS: An ecosystem-based integrated approach to planning and implementation of SLM interventions under MGNREGS (employment guarantee scheme) is needed. The annual outlay of MGNREGS is USD ~10 billion could be better optimized by allocating the resources and planning at ecosystem level.



## AE principles on food system/consumer level

Politics have to ensure fairness for market access and favourable market negotiation power of the farmers and conditions for quality of life in rural areas. The main recommendations are the following:

- Market linkages for agroecological produced goods need to be established and hence development of supporting value chains
- Strengthening the market access of farmers through farmer producer organisations (FPOs).
- Strengthening the connection between producer and consumer is recommended, e.g. through the promotion of producer groups and producer/consumer associations.
- Where the free market fails to provide fair distribution of benefits and income, incentives need to ensure the share of the benefits of the farmers.

## AE principles in politics and research

Land and resource governance need attention and continuous improvements. Maintenance, such as; water conservation, harvesting structures, catchment facilities and flood retention, and soil erosion measures will always need continuous resources and support. To enable society to share the benefits with the farmers, the following can be considered:

- Effective and efficient ecosystem-based planning can be based on digital approaches (e.g., GIS)
- The support from key research institutions is needed to get the science behind CBNF and AE
- Communication of benefits rights from farmers to policy makers needs to be enhanced.
- Building on construction and wage works to more AE based planning.
- Blended finance models are needed. To capitalize on the potential for climate change adaptation and mitigation, additional financing and incentive systems through opportunities like the GCF, NAF, carbon markets, and others, needs to be mobilized to promote AE in India
- Co-benefits arising from AE - climate adaptation, mitigation and wider resilience - contribute to India's commitments on various international conventions.
- Implementation of agroecological measures needs convergence of resources at district levels (using watershed and ecosystem boundaries) including resources of other line departments
- State support is essential. Farmers should have a shared benefit through providing incentives and subsidies, which are tailored to their needs for the implementation of AE principles on their holding (e.g., carbon sequestration, biodiversity, land degradation). Beyond the limited productivity benefits for farmers, their services that provide larger environmental benefits for the entire society needs to justifiably incentivised.
- Only an enabling environment with the necessary political commitment, a new legal framework, financial resources, research and supporting structures on the ground will lead to the agroecological transformation of the agro-food system in India and worldwide.





This policy brief was presented in a Virtual Stakeholder Policy Consultation on Agroecology in India held on 14 September 2021. A panel of representatives of the Ministry of Environment, Forests and Climate Change, the Ministry of Agriculture and Farmers Welfare, the Government of Madhya Pradesh, NABARD, the Foundation for Ecological Security, the National Coalition for Natural Farming and the National Rainfed Area Authority discussed the topic and policy brief with around 70 participants. Discussion results were incorporated in the above recommendations. The authors would like to thank the experts that took part in the policy consultation for their valuable contributions. The content and positions expressed are, however, those of the authors and do not necessarily reflect the perspectives of those who provided input, nor the organisations to which they are affiliated.

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#### **References**

For detailed information on the studies that build the foundation for this policy brief, please see study reports:  
[www.eld-initiative.org/en/where-we-work/asia/india](http://www.eld-initiative.org/en/where-we-work/asia/india)

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